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| 10/823,794 | 04/14/2004 | Kenji Otokita | Q80972 | 5343 |

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| EXAMINER | |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/823,794 | OTOKITA, KENJI | |
| | Examiner | Art Unit | |
| | MARCUS T. RILEY | 2625 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *20 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *04/14/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. **Claims 1-21** are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (US 6,666,539 B2 hereinafter, Sato '539) in combination with Otsuki (US 6,267,467 B1 hereinafter, Otsuki '467).

**Regarding claim 1;** Sato '539 discloses a printing method for printing, on a medium, an image in which a resolution in a first direction is higher than a resolution in a second direction by forming first dots or second dots that are smaller than said first dots at positions on said medium that correspond to pixels structuring said image, said method comprising the step of (*"...there is provided a method of recording by forming ink dots on a print medium during main scans. The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data, the transverse contour line being parallel to a main scan direction, the specific type image area being composed of pixels at which specific tones are recorded by forming ink dots; adjusting the dot data so as to regularly reduce amounts of an ink for forming ink dots on the identified transverse contour line; and recording tones of pixels on the print medium by forming ink dots in response to the*

*adjusted dot data, wherein this step includes the step of recording each of two pixels which are adjacent in the main scan direction, during each of different main scans, respectively."* column 1, lines 37-53). See also (*"...when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 7-14): forming the second dot at a position on said medium corresponding to a certain pixel if the first dot is to be formed at the position on said medium corresponding to said certain pixel (*"Here, if we focus on raster lines 1 through 3, with pass 1 (the first main scan), all the dots belonging to the first raster line are formed, and with pass 2, all the dots belonging to the second raster line are formed, and with pass 2, all the dots belonging to the third raster line are formed."* column 6, lines 10-15).

Sato '539 does not expressly disclose where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium

corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel.

Otsuki '467 discloses where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel (*"Condition c1: The number of sub-scan feeds in one feed cycle is equal to the nozzle pitch k."* column 7, lines 63-64). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26); condition 2: said first dot nor said second dot is

to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel (*"Condition c2: The nozzle offsets F after the respective sub-scan feeds in one feed cycle assume different values in the range of 0 to (k-1)."* column 7, lines 64-67). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26).

Sato '539 and Otsuki '467 are combinable because they are from same field of endeavor of printer systems (*"This invention relates to a color printing apparatus that*

*uses a print head for forming dots of a plurality of colors."* Otsuki '467 at column 1, lines 7-8).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printer system as taught by Sato '539 by adding where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel as taught by Otsuki '467.

The motivation for doing so would have been because it is advantageous to provide a printing technique that makes it possible to obtain high image quality with a specific print head (*"Accordingly, an object of the present invention is to provide a printing technique that makes it possible to obtain high image quality with a specific print head."* Otsuki '467 at column 2, lines 44-46).

Therefore, it would have been obvious to combine Sato '539 with Otsuki '467 to obtain the invention as specified in claim 1.

**Regarding claim 2;** Sato '539 discloses wherein said first dot is longer in said second direction than in said first direction (*"Skipping is performed because there is the risk that bleeding will occur on the transverse contour line if skipping is not done because the ink drops are long in the main scan direction with the printing device of the embodiment."* column 8, lines 57-60).

**Regarding claim 3;** Sato '539 discloses wherein said first dot has an oval shape (*"The white ovals show the ink dots formed at each pixel. The reason that the ink dots are ovals that are long in the main scan direction is that the ink drops arc ejected while the main scan is performed."* column 5, lines 16-19).

**Regarding claim 4;** Sato '539 discloses wherein: said first dots and said second dots are formed by a print head (*"FIG. 4 is an explanatory diagram that shows printing head 28 which includes a high-density nozzle array."* column 4, lines 49-50); See also (*"FIG. 2 is a schematic block diagram of the color printer 20. The color printer 20 comprises a secondary scan/feed mechanism for transporting printing paper P in the direction of sub-scan by means of a paper feed motor 22, a main scan/feed mechanism for reciprocating a carriage 30 in the axial direction (direction of main scan) of a platen 26 by means of a carriage motor 24, a head drive mechanism for ejecting the ink and forming dots by actuating the print head unit 60 ( print head assembly) mounted on the carriage 30..."* column 4, lines 4-12); said print head is movable in a predetermined direction (*"The color printer 20 comprises a secondary scan/feed mechanism for transporting printing paper P in the direction of sub-scan by means of a paper feed*

*motor 22, a main scan/feed mechanism for reciprocating a carriage 30 in the axial direction (direction of main scan) of a platen 26 by means of a carriage motor 24, a head drive mechanism for ejecting the ink and forming dots by actuating the print head unit 60 ( print head assembly) mounted on the carriage 30, and a control circuit 40 for exchanging signals among the paper feed motor 22, the carriage motor 24, the print head unit 60, and a control panel 32. The control circuit 40 is connected by a connector 56 to the computer 88."* column 4, lines 3-16); and said second direction is parallel to said predetermined direction (*"The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data, the transverse contour line being parallel to a main scan direction…"* column 1, lines 39-44).

**Regarding claim 5;** Sato '539 discloses wherein said medium is carried in a carrying direction when said medium is being printed (*"Color printer 20 that has the hardware configuration described above, while carrying paper P using paper feed motor 22, sends carriage 30 back and forth using carriage motor 24, and at the same time drives the piezoelectric element of printing head 28, ejects ink drops of each color to form ink drops and forms a multi-tone image on paper P."* column 5, lines 4-9); and said second direction is parallel to said carrying direction (*"The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line*

*of a specific type image area represented by the dot data, the transverse contour line being parallel to a main scan direction…"* column 1, lines 39-44).

**Regarding claim 6;** Sato '539 discloses the step of: converting the resolution of an image having a predetermined resolution in said first direction and a predetermined resolution in said second direction to obtain said image in which the resolution in said first direction is higher than the resolution in said second direction (*"The role of the resolution conversion module 97 is to convert the resolution (that is, the number of pixels per unit length) of the color video data handled by the application program 95 to a resolution that can be handled by the printer driver 96. The video data whose resolution has been converted in this manner constitute video information, which is composed of the three colors RGB. The color conversion module 98 converts the RGB video data to multi-tone data to obtain a plurality of ink colors suitable the color printer 20. The conversion is performed for each pixel while the color conversion table LUT is referenced."* column 3, lines 35-45).

**Regarding claim 7;** Sato '539 discloses wherein said predetermined resolution in said first direction and said predetermined resolution in said second direction are the same (*"Printing resolution setting menu RES: Pull down menu for selecting the combination of main scan direction and sub scan direction resolutions."* column 7, lines 44-46). See also See Figure 11 where the user may select from a pull down menu where the resolution in said first direction and resolution in said second direction are the same *ie.* [720dpi (Main-scan) x 720dpi (Sub-scan)].

**Regarding claim 8;** Sato '539 discloses wherein adjacent pixels among pixels that structure said image having the predetermined resolution are taken as a unit and regarded as a new pixel to obtain said image in which the resolution in said first direction is higher than the resolution in said second direction (*"In other words, when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 6-14).

**Regarding claim 9;** Sato '539 discloses wherein two adjacent pixels among the pixels that structure said image having the predetermined resolution are taken as a unit and regarded as a new pixel (*"The role of the resolution conversion module 97 is to convert the resolution (that is, the number of pixels per unit length) of the color video data handled by the application program 95 to a resolution that can be handled by the printer driver 96. The video data whose resolution has been converted in this manner constitute video information, which is composed of the three colors RGB. The color conversion module 98 converts the RGB video data to multi-tone data to obtain a plurality of ink colors suitable the color printer 20. The conversion is performed for each pixel while the color conversion table LUT is referenced."* column 3, lines 35-45).

**Regarding claim 10;** Sato '539 discloses wherein adjacent pixels in said second direction among the pixels that structure said image having the predetermined resolution

are taken as a unit and regarded as a new pixel (*"The role of the resolution conversion module 97 is to convert the resolution (that is, the number of pixels per unit length) of the color video data handled by the application program 95 to a resolution that can be handled by the printer driver 96. The video data whose resolution has been converted in this manner constitute video information, which is composed of the three colors RGB. The color conversion module 98 converts the RGB video data to multi-tone data to obtain a plurality of ink colors suitable the color printer 20. The conversion is performed for each pixel while the color conversion table LUT is referenced."* column 3, lines 35-45).

**Regarding claim 11;** Sato '539 discloses wherein an amount of information of pixel data of each of said pixels that structure said image in which the resolution in said first direction is higher than the resolution in said second direction is larger than an amount of information of pixel data of each of said pixels that structure said image having the predetermined resolution (*"In other words, when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 7-14).

**Regarding claim 12;** Sato '539 discloses wherein said amount of information of said pixel data of each of said pixels that structure said image in which the resolution in said first direction is higher than the resolution in said second direction is at least two bits (*"In other words, when printing with a printing resolution combination for which the*

*ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small. Specifically, the settings are made such that with the first example, a skipping rate of 50% is set according to a combination of 720 dpi x 360 dpi (the resolution ratio is two), and with the second example, a skipping rate of 33% is set according to a combination of 720 dpi x 720 dpi (the resolution ratio is one), and with the third example, the resolution ratio is 4). Note that the skipping rate setting is made taking into consideration not only the printing resolution ratio noted above, but also the size of the ink drops that can be ejected from the nozzle, and the ease of absorption of ink into the printing medium."* column 9, lines 7-24).

**Regarding claim 13;** Sato '539 discloses wherein said amount of information of said pixel data of each of said pixels that structure said image having the predetermined resolution is one bit (*"In other words, when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small. Specifically, the settings are made such that with the first example, a skipping rate of 50% is set according to a combination of 720 dpi x 360 dpi (the resolution ratio is two), and with the second example, a skipping rate of 33% is set according to a combination of 720 dpi x 720 dpi (the resolution ratio is one), and with the third example, the resolution ratio is 4). Note that the skipping rate*

*setting is made taking into consideration not only the printing resolution ratio noted above, but also the size of the ink drops that can be ejected from the nozzle, and the ease of absorption of ink into the printing medium."* column 9, lines 7-24).

**Regarding claim 14;** Sato '539 discloses wherein the image printed on said medium is an image in which a predetermined region is filled in with said first dots or said second dots (*"In order to attain the above and the other objects of the present invention, there is provided a method of recording by forming ink dots on a print medium during main scans. The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data…"* column 1, lines 36-40).

**Regarding claim 15;** Sato '539 discloses wherein said position on said medium corresponding to said certain pixel is at an outline section of said predetermined region (*"…an object of the present invention is to reduce ink bleeding in an outline portion parallel to the main scan direction in a printing device for printing images by ejecting ink droplets during main scans."* column 1, lines 32-35).

**Regarding claim 16;** Sato '539 discloses wherein the image printed on said medium is text (*"This process reduces the size of the ink accumulations, to thereby suppress bleeding that occurs at transverse contour lines. As a result, it is possible to print sharp images of line-drawings including a text image."* column 1, lines 59-63).

**Regarding claim 17;** Sato '539 discloses a printing method for printing, on a medium, an image in which a resolution in a first direction is higher than a resolution in a second direction by forming first dots or second dots that are smaller than said first dots at positions on said medium that correspond to pixels structuring said image, said method comprising the step of (*"...there is provided a method of recording by forming ink dots on a print medium during main scans. The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data, the transverse contour line being parallel to a main scan direction, the specific type image area being composed of pixels at which specific tones are recorded by forming ink dots; adjusting the dot data so as to regularly reduce amounts of an ink for forming ink dots on the identified transverse contour line; and recording tones of pixels on the print medium by forming ink dots in response to the adjusted dot data, wherein this step includes the step of recording each of two pixels which are adjacent in the main scan direction, during each of different main scans, respectively."* column 1, lines 37-53). See also (*"...when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 7-14): forming the second dot at a position on said medium corresponding to a certain pixel if the first dot is to be formed at the position on said medium corresponding to said certain pixel (*"Here, if*

*we focus on raster lines 1 through 3, with pass 1 (the first main scan), all the dots belonging to the first raster line are formed, and with pass 2, all the dots belonging to the second raster line are formed, and with pass 2, all the dots belonging to the third raster line are formed."* column 6, lines 10-15); a said first dot has an oval shape that is longer in said second direction than in said first direction (*"The white ovals show the ink dots formed at each pixel. The reason that the ink dots are ovals that are long in the main scan direction is that the ink drops arc ejected while the main scan is performed."* column 5, lines 16-19); (*"Skipping is performed because there is the risk that bleeding will occur on the transverse contour line if skipping is not done because the ink drops are long in the main scan direction with the printing device of the embodiment."* column 8, lines 57-60); said first dots and said second dots are formed by a print head (*"FIG. 4 is an explanatory diagram that shows printing head 28 which includes a high-density nozzle array."* column 4, lines 49-50); See also (*"FIG. 2 is a schematic block diagram of the color printer 20. The color printer 20 comprises a secondary scan/feed mechanism for transporting printing paper P in the direction of sub-scan by means of a paper feed motor 22, a main scan/feed mechanism for reciprocating a carriage 30 in the axial direction (direction of main scan) of a platen 26 by means of a carriage motor 24, a head drive mechanism for ejecting the ink and forming dots by actuating the print head unit 60 ( print head assembly) mounted on the carriage 30…"* column 4, lines 4-12); said print head is movable in a predetermined direction (*"The color printer 20 comprises a secondary scan/feed mechanism for transporting printing paper P in the direction of sub-scan by means of a paper feed motor 22, a main scan/feed mechanism for reciprocating a carriage 30 in the axial direction (direction of main scan) of a platen 26 by means of a*

*carriage motor 24, a head drive mechanism for ejecting the ink and forming dots by actuating the print head unit 60 ( print head assembly) mounted on the carriage 30, and a control circuit 40 for exchanging signals among the paper feed motor 22, the carriage motor 24, the print head unit 60, and a control panel 32. The control circuit 40 is connected by a connector 56 to the computer 88."* column 4, lines 3-16); said second direction is parallel to said predetermined direction (*"The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data, the transverse contour line being parallel to a main scan direction…"* column 1, lines 39-44); the resolution of an image having a predetermined resolution in said first direction and a predetermined resolution in said second direction is converted to obtain said image in which the resolution in said first direction is higher than the resolution in said second direction (*"The role of the resolution conversion module 97 is to convert the resolution (that is, the number of pixels per unit length) of the color video data handled by the application program 95 to a resolution that can be handled by the printer driver 96. The video data whose resolution has been converted in this manner constitute video information, which is composed of the three colors RGB. The color conversion module 98 converts the RGB video data to multi-tone data to obtain a plurality of ink colors suitable the color printer 20. The conversion is performed for each pixel while the color conversion table LUT is referenced."* column 3, lines 35-45); said predetermined resolution in said first direction and said predetermined resolution in said second direction are the same (*"Printing resolution setting menu RES: Pull down menu for selecting the combination of main scan*

*direction and sub scan direction resolutions."* column 7, lines 44-46). See also See Figure 11 where the user may select from a pull down menu where the resolution in said first direction and resolution in said second direction are the same *ie.* [720dpi (Main-scan) x 720dpi (Sub-scan)]; two pixels adjacent to each other in said second direction among the pixels that structure said image having the predetermined resolution are taken as a unit and regarded as a new pixel to obtain said image in which the resolution in said first direction is higher than the resolution in said second direction (*"The role of the resolution conversion module 97 is to convert the resolution (that is, the number of pixels per unit length) of the color video data handled by the application program 95 to a resolution that can be handled by the printer driver 96. The video data whose resolution has been converted in this manner constitute video information, which is composed of the three colors RGB. The color conversion module 98 converts the RGB video data to multi-tone data to obtain a plurality of ink colors suitable the color printer 20. The conversion is performed for each pixel while the color conversion table LUT is referenced."* column 3, lines 35-45); an amount of information of pixel data of each of said pixels that structure said image in which the resolution in said first direction is higher than the resolution in said second direction is larger than an amount of information of pixel data of each of said pixels that structure said image having the predetermined resolution (*"In other words, when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 7-14); said amount of information of said pixel data of each of

said pixels that structure said image in which the resolution in said first direction is higher than the resolution in said second direction is at least two bits (*"In other words, when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small. Specifically, the settings are made such that with the first example, a skipping rate of 50% is set according to a combination of 720 dpi x 360 dpi (the resolution ratio is two), and with the second example, a skipping rate of 33% is set according to a combination of 720 dpi x 720 dpi (the resolution ratio is one), and with the third example, the resolution ratio is 4). Note that the skipping rate setting is made taking into consideration not only the printing resolution ratio noted above, but also the size of the ink drops that can be ejected from the nozzle, and the ease of absorption of ink into the printing medium."* column 9, lines 7-24); said amount of information of said pixel data of each of said pixels that structure said image having the predetermined resolution is one bit (*"In other words, when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small. Specifically, the settings are made such that with the first example, a skipping rate of 50% is set according to a combination of 720 dpi x 360 dpi (the resolution ratio is two), and with the second example, a skipping rate of 33% is set according to a combination of 720 dpi x 720 dpi (the resolution ratio is one), and with the third example, the resolution*

*ratio is 4). Note that the skipping rate setting is made taking into consideration not only the printing resolution ratio noted above, but also the size of the ink drops that can be ejected from the nozzle, and the ease of absorption of ink into the printing medium."* column 9, lines 7-24); the image printed on said medium is an image in which a predetermined region is filled in with said first dots or said second dots (*"In order to attain the above and the other objects of the present invention, there is provided a method of recording by forming ink dots on a print medium during main scans. The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data…"* column 1, lines 36-40); said position on said medium corresponding to said certain pixel is at an outline section of said predetermined region(*"…an object of the present invention is to reduce ink bleeding in an outline portion parallel to the main scan direction in a printing device for printing images by ejecting ink droplets during main scans."* column 1, lines 32-35); and the image printed on said medium is text (*"This process reduces the size of the ink accumulations, to thereby suppress bleeding that occurs at transverse contour lines. As a result, it is possible to print sharp images of line-drawings including a text image."* column 1, lines 59-63).

Sato '539 does not expressly disclose where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium

corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel.

Otsuki '467 discloses where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel (*"Condition c1: The number of sub-scan feeds in one feed cycle is equal to the nozzle pitch k."* column 7, lines 63-64). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take*

*different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26); or condition 2: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel (*"Condition c2: The nozzle offsets F after the respective sub-scan feeds in one feed cycle assume different values in the range of 0 to (k-1)."* column 7, lines 64-67). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed*

*cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26):

Sato '539 and Otsuki '467 are combinable because they are from same field of endeavor of printer systems (*"This invention relates to a color printing apparatus that uses a print head for forming dots of a plurality of colors."* Otsuki '467 at column 1, lines 7-8).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printer system as taught by Sato '539 by adding where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel as taught by Otsuki '467.

The motivation for doing so would have been because it is advantageous to provide a printing technique that makes it possible to obtain high image quality with a specific print head (*"Accordingly, an object of the present invention is to provide a printing technique that makes it possible to obtain high image quality with a specific print head."* Otsuki '467 at column 2, lines 44-46).

Therefore, it would have been obvious to combine Sato ‘539 with Otsuki ‘467 to obtain the invention as specified in claim 17.

**Regarding claim 18;** Sato ‘539 discloses a control method for correlating either first dot information about a first dot or second dot information about a second dot that is smaller than said first dot to each of a plurality of pixels that structure an image in which a resolution in a first direction is higher than a resolution in a second direction, and for outputting said first dot information and said second dot information, said method comprising the step of (*“...there is provided a method of recording by forming ink dots on a print medium during main scans. The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data, the transverse contour line being parallel to a main scan direction, the specific type image area being composed of pixels at which specific tones are recorded by forming ink dots; adjusting the dot data so as to regularly reduce amounts of an ink for forming ink dots on the identified transverse contour line; and recording tones of pixels on the print medium by forming ink dots in response to the adjusted dot data, wherein this step includes the step of recording each of two pixels which are adjacent in the main scan direction, during each of different main scans, respectively.”* column 1, lines 37-53). See also (*“...when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination*

*for which the resolution ratio is relatively small."* column 9, lines 7-14):correlating said second dot information to a certain pixel if said first dot information is correlated to said certain pixel (*"Here, if we focus on raster lines 1 through 3, with pass 1 (the first main scan), all the dots belonging to the first raster line are formed, and with pass 2, all the dots belonging to the second raster line are formed, and with pass 2, all the dots belonging to the third raster line are formed."* column 6, lines 10-15).

Sato '539 does not expressly disclose where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel.

Otsuki '467 discloses where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot information nor said second dot information is correlated to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot information nor said second dot information is correlated to two pixels that are adjacent, in said second direction, to said one adjacent pixel (*"Condition c1: The number of sub-scan feeds in one feed cycle is*

*equal to the nozzle pitch k."* column 7, lines 63-64). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26); or condition 2: neither said first dot information nor said second dot information is correlated to the other adjacent pixel of said two adjacent pixels, and neither said first dot information nor said second dot information is correlated to two pixels that are adjacent, in said second direction, to said other adjacent pixel (*"Condition c2: The nozzle offsets F after the respective sub-scan feeds in one feed cycle assume different values in the range of 0 to (k-1). ur."* column 7, lines 64-67). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the*

*reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26).

Sato '539 and Otsuki '467 are combinable because they are from same field of endeavor of printer systems (*"This invention relates to a color printing apparatus that uses a print head for forming dots of a plurality of colors."* Otsuki '467 at column 1, lines 7-8).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printer system as taught by Sato '539 by adding where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be

formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel as taught by Otsuki '467.

The motivation for doing so would have been because it is advantageous to provide a printing technique that makes it possible to obtain high image quality with a specific print head (*"Accordingly, an object of the present invention is to provide a printing technique that makes it possible to obtain high image quality with a specific print head."* Otsuki '467 at column 2, lines 44-46).

Therefore, it would have been obvious to combine Sato '539 with Otsuki '467 to obtain the invention as specified in claim 18.

**Regarding claim 19;** Sato '539 discloses a printing apparatus comprising: a head that is capable of forming, on a medium, first dots and second dots that are smaller than said first dots (*"...there is provided a method of recording by forming ink dots on a print medium during main scans. The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data, the transverse contour line being parallel to a main scan direction, the specific type image area being composed of pixels at which specific tones are recorded by forming ink dots; adjusting the dot data so as to regularly reduce amounts of an ink for forming ink dots on the identified transverse contour line; and recording tones of pixels on the print medium by forming ink dots in response to the*

*adjusted dot data, wherein this step includes the step of recording each of two pixels which are adjacent in the main scan direction, during each of different main scans, respectively."* column 1, lines 37-53). See also (*"...when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 7-14): wherein said printing apparatus prints, on said medium, an image in which a resolution in a first direction is higher than a resolution in a second direction by forming said first dots or said second dots at positions on said medium that correspond to pixels structuring said image (*"In other words, when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 7-14); and wherein said printing apparatus forms the second dot at a position on said medium corresponding to a certain pixel if the first dot is to be formed at the position on said medium corresponding to said certain pixel (*"Here, if we focus on raster lines 1 through 3, with pass 1 (the first main scan), all the dots belonging to the first raster line are formed, and with pass 2, all the dots belonging to the second raster line are formed, and with pass 2, all the dots belonging to the third raster line are formed."* column 6, lines 10-15).

Sato '539 does not expressly disclose where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be

formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel.

Otsuki '467 discloses where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel (*"Condition c1: The number of sub-scan feeds in one feed cycle is equal to the nozzle pitch k."* column 7, lines 63-64). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first*

*condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26); or condition 2: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel (*"Condition c2: The nozzle offsets F after the respective sub-scan feeds in one feed cycle assume different values in the range of 0 to (k-1)."* column 7, lines 64-67). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to*

*(k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26):

Sato '539 and Otsuki '467 are combinable because they are from same field of endeavor of printer systems (*"This invention relates to a color printing apparatus that uses a print head for forming dots of a plurality of colors."* Otsuki '467 at column 1, lines 7-8).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printer system as taught by Sato '539 by adding where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel as taught by Otsuki '467.

The motivation for doing so would have been because it is advantageous to provide a printing technique that makes it possible to obtain high image quality with a specific print head (*"Accordingly, an object of the present invention is to provide a*

*printing technique that makes it possible to obtain high image quality with a specific print head."* Otsuki '467 at column 2, lines 44-46).

Therefore, it would have been obvious to combine Sato '539 with Otsuki '467 to obtain the invention as specified in claim 19.

**Regarding claim 20;** Sato '539 discloses a control apparatus comprising: a controller for correlating either first dot information about a first dot or second dot information about a second dot that is smaller than said first dot to each of a plurality of pixels that structure an image in which a resolution in a first direction is higher than a resolution in a second direction and outputting said first dot information and said second dot information (*"...there is provided a method of recording by forming ink dots on a print medium during main scans. The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data, the transverse contour line being parallel to a main scan direction, the specific type image area being composed of pixels at which specific tones are recorded by forming ink dots; adjusting the dot data so as to regularly reduce amounts of an ink for forming ink dots on the identified transverse contour line; and recording tones of pixels on the print medium by forming ink dots in response to the adjusted dot data, wherein this step includes the step of recording each of two pixels which are adjacent in the main scan direction, during each of different main scans, respectively."* column 1, lines 37-53). See also (*"...when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution*

*in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 7-14): and correlating said second dot information to a certain pixel if said first dot information is correlated to said certain pixel (*"Here, if we focus on raster lines 1 through 3, with pass 1 (the first main scan), all the dots belonging to the first raster line are formed, and with pass 2, all the dots belonging to the second raster line are formed, and with pass 2, all the dots belonging to the third raster line are formed."* column 6, lines 10-15);

Sato '539 does not expressly disclose where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel.

Otsuki '467 discloses at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot information nor said second dot information is correlated to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot information nor said second dot

information is correlated to two pixels that are adjacent, in said second direction, to said one adjacent pixel (*"Condition c1: The number of sub-scan feeds in one feed cycle is equal to the nozzle pitch k."* column 7, lines 63-64). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26); or condition 2: neither said first dot information nor said second dot information is correlated to the other adjacent pixel of said two adjacent pixels, and neither said first dot information nor said second dot information is correlated to two pixels that are adjacent, in said second direction, to said other adjacent pixel (*"Condition c2: The nozzle offsets F after the respective sub-scan feeds in one feed cycle assume different values in the range of 0 to (k-1)."* column 7, lines 64-67). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the*

*number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26).

Sato '539 and Otsuki '467 are combinable because they are from same field of endeavor of printer systems (*"This invention relates to a color printing apparatus that uses a print head for forming dots of a plurality of colors."* Otsuki '467 at column 1, lines 7-8).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printer system as taught by Sato '539 by adding where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at

positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel as taught by Otsuki '467.

The motivation for doing so would have been because it is advantageous to provide a printing technique that makes it possible to obtain high image quality with a specific print head (*"Accordingly, an object of the present invention is to provide a printing technique that makes it possible to obtain high image quality with a specific print head."* Otsuki '467 at column 2, lines 44-46).

Therefore, it would have been obvious to combine Sato '539 with Otsuki '467 to obtain the invention as specified in claim 20.

**Regarding claim 21;** Sato '539 discloses a computer-readable storage medium having recorded thereon a computer program for causing a printing apparatus comprising a head that is capable of forming, on a medium, first dots and second dots that are smaller than said first dots to achieve functions of (*"...there is provided a method of recording by forming ink dots on a print medium during main scans. The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data, the transverse contour line being parallel to a main scan direction, the specific type image area being composed of*

*pixels at which specific tones are recorded by forming ink dots; adjusting the dot data so as to regularly reduce amounts of an ink for forming ink dots on the identified transverse contour line; and recording tones of pixels on the print medium by forming ink dots in response to the adjusted dot data, wherein this step includes the step of recording each of two pixels which are adjacent in the main scan direction, during each of different main scans, respectively."* column 1, lines 37-53). See also (*"...when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 7-14): printing, on said medium, an image in which a resolution in a first direction is higher than a resolution in a second direction by forming said first dots or said second dots at positions on said medium that correspond to pixels structuring said image (*"In other words, when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 7-14); and forming the second dot at a position on said medium corresponding to a certain pixel if the first dot is to be formed at the position on said medium corresponding to said certain pixel (*"Here, if we focus on raster lines 1 through 3, with pass 1 (the first main scan), all the dots belonging to the first raster line are formed, and with pass 2, all the dots belonging to the second raster line are formed, and with pass 2, all the dots belonging to the third raster line are formed."* column 6, lines 10-15).

Sato ‘539 does not expressly disclose where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel.

Otsuki ‘467 discloses where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel (*“Condition c1: The number of sub-scan feeds in one feed cycle is equal to the nozzle pitch k.”* column 7, lines 63-64). See also (*“The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is*

*less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26); or condition 2: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel (*"Condition c2: The nozzle offsets F after the respective sub-scan feeds in one feed cycle assume different values in the range of 0 to (k-1)."* column 7, lines 64-67). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no*

*skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26).

Sato '539 and Otsuki '467 are combinable because they are from same field of endeavor of printer systems (*"This invention relates to a color printing apparatus that uses a print head for forming dots of a plurality of colors."* Otsuki '467 at column 1, lines 7-8).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printer system as taught by Sato '539 by adding where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel as taught by Otsuki '467.

The motivation for doing so would have been because it is advantageous to provide a printing technique that makes it possible to obtain high image quality with a specific print head (*"Accordingly, an object of the present invention is to provide a printing technique that makes it possible to obtain high image quality with a specific print head."* Otsuki '467 at column 2, lines 44-46).

Therefore, it would have been obvious to combine Sato '539 with Otsuki '467 to obtain the invention as specified in claim 21.

**Regarding claim 22;** Sato '539 discloses a computer-readable storage medium having recorded thereon a computer program for causing a control apparatus comprising a controller to achieve functions of: correlating either first dot information about a first dot or second dot information about a second dot that is smaller than said first dot to each of a plurality of pixels that structure an image in which a resolution in a first direction is higher than a resolution in a second direction and outputting said first dot information and said second dot information (*"...there is provided a method of recording by forming ink dots on a print medium during main scans. The method comprises the steps of: generating dot data from image data indicative of a image to be printed, the dot data representing a state of dot formation at each pixel; identifying a transverse contour line of a specific type image area represented by the dot data, the transverse contour line being parallel to a main scan direction, the specific type image area being composed of pixels at which specific tones are recorded by forming ink dots; adjusting the dot data so as to regularly reduce amounts of an ink for forming ink dots on the identified transverse contour line; and recording tones of pixels on the print medium by forming ink dots in*

*response to the adjusted dot data, wherein this step includes the step of recording each of two pixels which are adjacent in the main scan direction, during each of different main scans, respectively."* column 1, lines 37-53). See also (*"...when printing with a printing resolution combination for which the ratio of the main scan direction printing resolution in relation to the sub scan direction printing resolution is relatively large, the skipping rate is adjusted to be higher than when printing with a printing resolution combination for which the resolution ratio is relatively small."* column 9, lines 7-14): and correlating said second dot information to a certain pixel if said first dot information is correlated to said certain pixel (*"Here, if we focus on raster lines 1 through 3, with pass 1 (the first main scan), all the dots belonging to the first raster line are formed, and with pass 2, all the dots belonging to the second raster line are formed, and with pass 2, all the dots belonging to the third raster line are formed."* column 6, lines 10-15).

Otsuki '467 discloses where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot information nor said second dot information is correlated to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot information nor said second dot information is correlated to two pixels that are adjacent, in said second direction, to said one adjacent pixel (*"Condition c1: The number of sub-scan feeds in one feed cycle is equal to the nozzle pitch k."* column 7, lines 63-64). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the*

*number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26); or condition 2: neither said first dot information nor said second dot information is correlated to the other adjacent pixel of said two adjacent pixels, and neither said first dot information nor said second dot information is correlated to two pixels that are adjacent, in said second direction, to said other adjacent pixel (*"Condition c2: The nozzle offsets F after the respective sub-scan feeds in one feed cycle assume different values in the range of 0 to (k-1)."* column 7, lines 64-67). See also (*"The above conditions can be understood as follows. Since (k-1) raster lines are present between adjoining nozzles, the number of sub-scan feeds required in one feed cycle is equal to k so that the (k-1) raster lines are serviced during one feed cycle and that the nozzle position returns to the reference position (the position of the offset F equal to zero) after one feed cycle. If the number of sub-scan feeds in one feed cycle is less than k, some raster lines will be skipped. If the number of sub-scan feeds in one feed cycle is greater than k, on the other hand, some raster lines will be overwritten. The first condition c1 is accordingly required. If the number of sub-scan feeds in one feed cycle is equal to k, there will be no skipping or*

*overwriting of raster lines to be recorded only when the nozzle offsets F after the respective sub-scan feeds in one feed cycle take different values in the range of 0 to (k-1). The second condition c2 is accordingly required. When the first and the second conditions c1 and c2 are satisfied, each of the N nozzles records k raster lines in one feed cycle. Namely N x k raster lines can be recorded in one feed cycle."* column 8, lines 6-26).

Sato '539 and Otsuki '467 are combinable because they are from same field of endeavor of printer systems (*"This invention relates to a color printing apparatus that uses a print head for forming dots of a plurality of colors."* Otsuki '467 at column 1, lines 7-8).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the printer system as taught by Sato '539 by adding where at least either one of condition 1 or condition 2 below is met: condition 1: neither said first dot nor said second dot is to be formed at a position on said medium corresponding to one adjacent pixel of either two adjacent pixels that are adjacent, in said first direction, to said certain pixel, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said one adjacent pixel; condition 2: said first dot nor said second dot is to be formed at a position on said medium corresponding to the other adjacent pixel of said two adjacent pixels, and neither said first dot nor said second dot is to be formed at positions on said medium corresponding to two pixels that are adjacent, in said second direction, to said other adjacent pixel as taught by Otsuki '467.

The motivation for doing so would have been because it is advantageous to provide a printing technique that makes it possible to obtain high image quality with a specific print head (*"Accordingly, an object of the present invention is to provide a printing technique that makes it possible to obtain high image quality with a specific print head."* Otsuki '467 at column 2, lines 44-46).

Therefore, it would have been obvious to combine Sato '539 with Otsuki '467 to obtain the invention as specified in claim 22.

## ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARCUS T. RILEY whose telephone number is (571)270-1581. The examiner can normally be reached on Monday - Friday, 7:30-5:00, est.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Twyler L. Haskins can be reached on 571-272-7406. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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